AMENDMENTS TO THE CLAIMS

Please **AMEND** claim 9 as shown below.

This listing of claims will replace all prior versions, and listings, of claims in the application.

- 1. (Withdrawn) A binder for a lithium-sulfur battery, comprising: a butadiene-based copolymer.
- 2. (Withdrawn) The binder of claim 1, wherein the butadiene-based copolymer is selected from the group consisting of an acrylonitrile-butadiene-styrene copolymer, an acrylonitrile-butadiene copolymer, and a modified styrene-butadiene copolymer.
- 3. (Withdrawn) The binder of claim 2, wherein the butadiene-based copolymer is selected from the group consisting of an acrylonitrile-butadiene-styrene rubber, an acrylonitrile-butadiene rubber, and a modified styrene-butadiene rubber.
- 4. (Withdrawn) The binder of claim 1, wherein the butadiene-based copolymer is represented by Formula 1:

$$\begin{array}{c}
-\langle \text{CH}_2 - \text{CH} \rangle_{x} \langle \text{CH}_2 \text{CH} = \text{CHCH}_2 \rangle_{y} \langle \text{CH}_2 - \text{CH} \rangle_{z} \\
-\langle \text{CH}_2 - \text{CH} \rangle_{x} \langle \text{CH}_2 \text{CH} = \text{CHCH}_2 \rangle_{y} \langle \text{CH}_2 - \text{CH} \rangle_{z} \\
-\langle \text{CH}_2 - \text{CH} \rangle_{x} \langle \text{CH}_2 - \text{CH} \rangle_{z} \rangle_{y} \langle \text{CH}_2 - \text{CH} \rangle_{z} \rangle_{z} \\
-\langle \text{CH}_2 - \text{CH} \rangle_{x} \langle \text{CH}_2 - \text{CH} \rangle_{z} \rangle_{y} \langle \text{CH}_2 - \text{CH} \rangle_{z} \rangle_{z$$

and wherein:

when x is 0, y ranges from about 5 to about 40, and z ranges from about 60 to about 95;

when z is 0, x ranges from about 60 to about 95 and y ranges from about 5 to about 40; and

when x, y, and z do not equal 0, x ranges from about 20 to about 75, y ranges from about 5 to about 20, and z ranges from about 20 to about 75.

- 5. (Withdrawn) The binder of claim 1, wherein the butadiene-based copolymer is a non-aqueous material.
 - 6. (Withdrawn) The binder of claim 1, further comprising a fluorine-based polymer.
- 7. (Withdrawn) The binder of claim 6, wherein the fluorine-based polymer is represented by Formula 2:

$$\begin{array}{c|cccc}
F & H & F & F \\
 & | & | & | & | & | \\
C & -C & C & | & | & | & | \\
F & H & F & CF_3
\end{array}$$

(2)

and wherein a ranges from about 0.5 to about 1.0, and b ranges from about 0 to about 0.5.

8. (Withdrawn) The binder of claim 6, wherein the fluorine-based polymer is selected from the group consisting of a homopolymer prepared from monomers selected from the group consisting of C₂F₃Cl, C₂H₃F and CH₃(CF₃C₂H₄)SiO, and a copolymer including a first monomer and a second monomer, wherein the first monomer is selected from the group consisting of

 C_2F_4 , C_2F_3CI , CH_2CF_2 , C_2H_3F and $CH_3(CF_3C_2H_4)SiO$, and the second monomer is selected from the group consisting of C_2H_4 , C_3H_6 , CH_2 =CHOR where R is a C_1 to C_{20} alkyl group, C_3F_6 and CF_2 =CFORf where Rf is a C_1 to C_{20} alkyl group with at least one fluorine atom.

9. (Currently Amended) A positive active material composition for a lithium-sulfur battery, comprising:

a positive active material comprising sulfur or a sulfur-based compound;

a conductive agent;

an organic solvent;

a binder comprising a butadiene-based copolymer, wherein the binder is distributed in the organic solvent to form an emulsion, the binder having with-particle sizes of 15 micrometers or less; and

an agent for controlling viscosity.

- 10. (Original) The positive active material composition of claim 9, wherein the binder is presented in the amount of 2 to 6% by weight of the positive active material composition.
- 11. (Original) The positive active material composition of claim 10, wherein the binder is presented in the amount of 2 to 3% by weight of the positive active material composition.
- 12. (Original) The positive active material composition of claim 9, wherein the butadiene-based copolymer is selected from the group consisting of an acrylonitrile-butadiene-styrene copolymer, an acrylonitrile-butadiene copolymer, and a modified styrene-butadiene copolymer.

- 13. (Original) The positive active material composition of claim 12, wherein the butadiene-based copolymer is selected from the group consisting of an acrylonitrile-butadiene-styrene rubber, an acrylonitrile-butadiene rubber, and a modified styrene-butadiene rubber.
- 14. (Original) The positive active material composition of claim 9, wherein the butadiene-based copolymer is represented by Formula 1:

$$\begin{array}{c}
-\langle \text{CH}_2 - \text{CH} \xrightarrow{}_{x} \langle \text{CH}_2 \text{CH} = \text{CHCH}_2 \xrightarrow{}_{y} \langle \text{CH}_2 - \text{CH} \xrightarrow{}_{z} \\
-\langle \text{CH}_2 - \text{CH} \xrightarrow{}_{x} \langle \text{CH}_2 \text{CH} = \text{CHCH}_2 \xrightarrow{}_{y} \langle \text{CH}_2 - \text{CH} \xrightarrow{}_{z} \rangle
\end{array}$$
(1)

and wherein:

and

when x is 0, y ranges from about 5 to about 40, and z ranges from about 60 to about 95; when z is 0, x ranges from about 60 to about 95 and y ranges from about 5 to about 40;

when x, y, and z do not equal 0, x ranges from about 20 to about 75, y ranges from about 5 to about 20, and z ranges from about 20 to about 75.

- 15. (Original) The positive active material composition of claim 9, wherein the butadiene-based copolymer is non-aqueous.
- 16. (Withdrawn) The positive active material composition of claim 9, further comprising a fluorine-based polymer.
- 17. (Withdrawn) The positive active material composition of claim 16, wherein the fluorine-based polymer is represented by Formula 2:

and wherein a ranges from about 0.5 to about 1.0, and b ranges from about 0 to about 0.5.

- 18. (Withdrawn) The positive active material composition of claim 16, wherein the fluorine-based polymer is selected from the group consisting of a homopolymer prepared from monomers selected from the group consisting of C_2F_3CI , C_2H_3F and $CH_3(CF_3C_2H_4)SiO$, and a copolymer including a first monomer and a second monomer, wherein the first monomer is selected from the group consisting of C_2F_4 , C_2F_3CI , CH_2CF_2 , C_2H_3F and $CH_3(CF_3C_2H_4)SiO$, and the second monomer is selected from the group consisting of C_2H_4 , C_3H_6 , CH_2 =CHOR where R is a C_1 to C_{20} alkyl group, C_3F_6 and CF_2 =CFORf where Rf is a C_1 to C_{20} alkyl group with at least one fluorine atom.
- 19. (Original) The positive active material composition of claim 9, wherein the agent for controlling viscosity is selected from the group consisting of a cellulose-based polymer, polyvinyl alcohol, polyvinylpyrrolidone, polyacrylic acid, polyacrylamide, polyethyleneoxide, and polyethyleneimine.

- 20. (Original) The positive active material composition of claim 19, wherein the cellulose-based polymer is selected from the group consisting of methyl cellulose, hydroxypropyl methylcellulose, hydroxyethyl-cellulose, or carboxymethyl cellulose.
 - 21. (Withdrawn) A lithium-sulfur battery, comprising:

a positive electrode comprising a positive active material, a conductive agent, and a binder comprising a butadiene-based copolymer;

a negative electrode; and an electrolyte.

- 22. (Withdrawn) The lithium-sulfur battery of claim 21, wherein the butadiene-based copolymer is selected from the group consisting of an acrylonitrile-butadiene-styrene copolymer, an acrylonitrile-butadiene copolymer, and a modified styrene-butadiene copolymer.
- 23. (Withdrawn) The lithium-sulfur battery of claim 22, wherein the butadiene-based copolymer is selected from the group consisting of an acrylonitrile-butadiene-styrene rubber, an acrylonitrile-butadiene rubber, and a modified styrene-butadiene rubber.
- 24. (Withdrawn) The lithium-sulfur battery of claim 21, wherein the butadiene-based copolymer is represented by Formula 1:

$$\begin{array}{c} -(\text{CH}_2 - \text{CH})_{\overline{x}} (\text{CH}_2 \text{CH} = \text{CHCH}_2)_{\overline{y}} (\text{CH}_2 - \text{CH})_{\overline{z}} \\ \text{CN} & & & & & & & & & \\ \end{array}$$

and wherein:

when x is 0, y ranges from about 5 to about 40, and z ranges from about 60 to about 95;

(2)

when z is 0, x ranges from about 60 to about 95 and y ranges from about 5 to about 40; and

when x, y, and z do not equal 0, x ranges from about 20 to about 75, y ranges from about 5 to about 20, and z ranges from about 20 to about 75.

- 25. (Withdrawn) The lithium-sulfur battery of claim 21, wherein the butadiene-based copolymer is non-aqueous.
- 26. (Withdrawn) The lithium-sulfur battery of claim 21, further comprising a fluorine-based polymer.
- 27. (Withdrawn) The lithium-sulfur battery of claim 26, wherein the fluorine-based polymer is represented by Formula 2:

$$\begin{array}{c|cccc}
F & H & F & F \\
 & | & | & | & | \\
C & C & C & C & C \\
 & | & | & | & | \\
F & H & F & CF_3
\end{array}$$

and wherein a ranges from about 0.5 to about 1.0, and b ranges from about 0 to about 0.5.

28. (Withdrawn) The lithium-sulfur battery of claim 26, wherein the fluorine-based polymer is selected from the group consisting of a homopolymer prepared from monomers selected from the group consisting of C₂F₃Cl, C₂H₃F and CH₃(CF₃C₂H₄)SiO, and a copolymer

including a first monomer and a second monomer, wherein the first monomer is selected from the group consisting of C_2F_4 , C_2F_3CI , CH_2CF_2 , C_2H_3F and $CH_3(CF_3C_2H_4)SiO$, and the second monomer is selected from the group consisting of C_2H_4 , C_3H_6 , CH_2 =CHOR where R is a C_1 to C_{20} alkyl group, C_3F_6 and CF_2 =CFORf where Rf is a C_1 to C_{20} alkyl group with at least one fluorine atom.

- 29. (Withdrawn) The lithium-sulfur battery of claim 21, wherein the agent for controlling viscosity is selected from the group consisting of a cellulose-based polymer, polyvinyl alcohol, polyvinylpyrrolidone, polyacrylic acid, polyacrylamide, polyethyleneoxide, and polyethyleneimine.
- 30. (Withdrawn) The lithium-sulfur battery of claim 29, wherein the cellulose-based polymer is selected from the group consisting of methyl cellulose, hydroxypropyl methylcellulose, hydroxyethyl-cellulose, or carboxymethyl cellulose.